

1 Pre-Class Work.

1. $\text{roots}() = \{\emptyset\}$ (empty) \Rightarrow no zeros

$\text{roots}([1 \ 7 \ 12 \ 0]) = 0, -4, -3$

\Rightarrow poles at $0, -4, -3$.

2. Marginally stable.

3. See CLT, next page.

4. $G_{cl}(s) = \frac{KN(s)}{D(s) + KN(s)} = \frac{K}{s^2 + 7s^2 + 12s + K}$

2 In-class Work.

1. (a) - F

(b) - F

(c) - T

(d) - F.

2. (b)

3. ~~low~~ ^{high} damping ratio for low K , low damping ratio for high K .

(c) is correct.

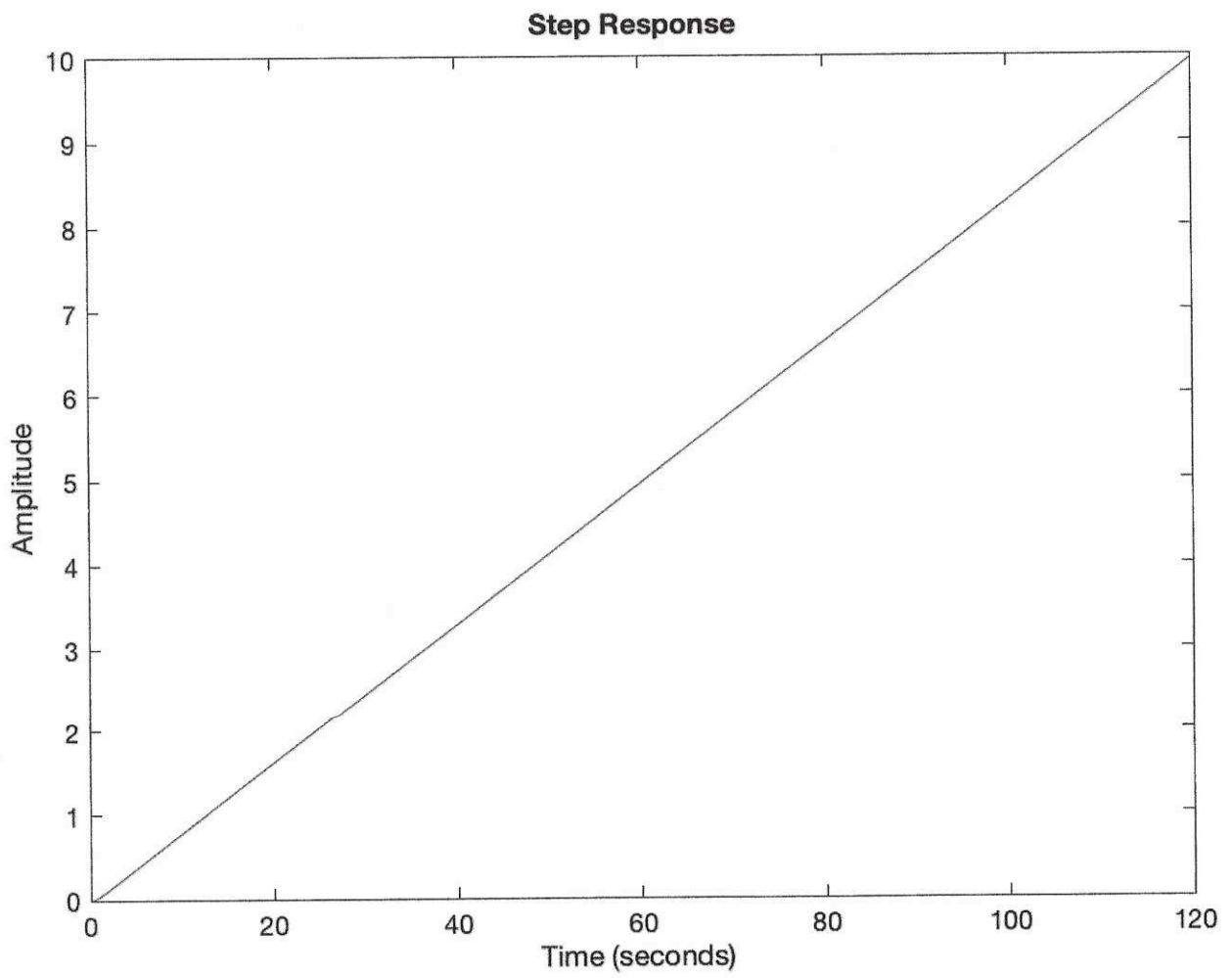
(a) is correct.

4. Hurwitz criterion: $a_i > 0$ is true for $\boxed{K > 0}$,

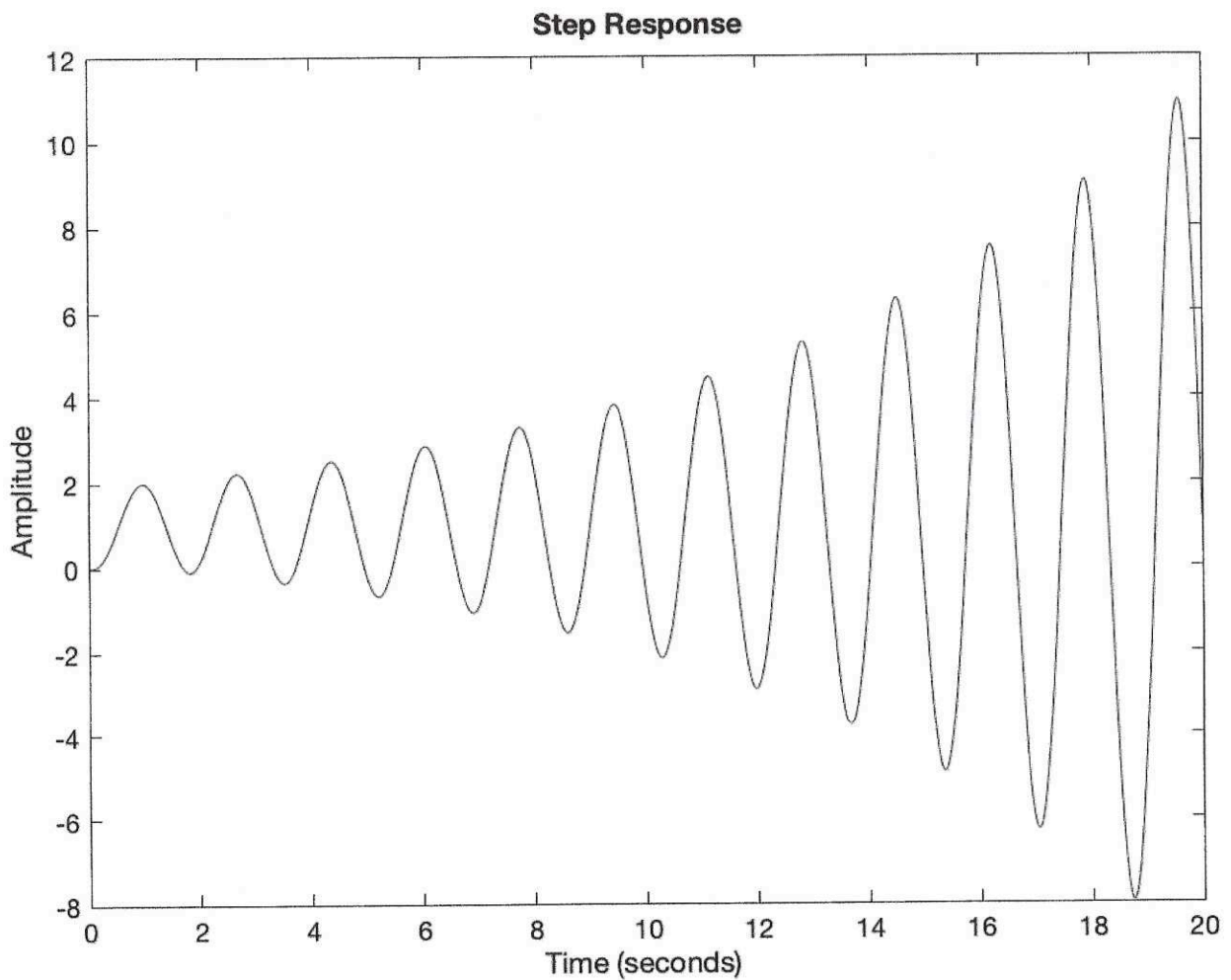
$a_1 a_2 - a_3 = 7 \cdot 12 - K > 0$

$\boxed{84 > K}$ for stability.

1.3



2.5



The sun tracker oscillates around 1 with increasing magnitude, unlike those in Fig 4, which show decreasing magnitude. The high ^{control} gain has destabilized the system.